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Code No: 136CC

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, November/December - 2020

IC ENGINES AND GAS TURBINES

(Mechanical Engineering)

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Time: 2 hours

Max. Marks: 75

Answer any five questions

All questions carry equal marks

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- 1.a) Draw the P-V diagram and the typical valve timing diagram for a two stroke IC engine.
b) Describe the influence of ignition quality of CI engine fuels on cold starting, engine roughness and compression ratio. [7+8]

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- 2.a) Distinguish between intermittent and continuous IC engines. Give some examples of these type of engines.

- b) Mention some of the additives to increase the octane number of fuels. What are the advantages and disadvantages of using leaded gasolines? [7+8]

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- 3.a) Compare the knocking phenomena in SI and CI engines. Explain clearly that the factors which tend to prevent knock in SI engines, in fact promote knock in CI engines.

- b) Calculate the theoretical air/fuel and fuel/air ratios for the complete combustion of methanol. If the air is supplied at 1 bar and 25°C, calculate the volume of air required for complete combustion of fuel per kg and per kg mole of fuel. [8+7]

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4. An engine having a single jet carburettor consumes 6.0 kg/h of fuel. The density of fuel is 750 kg/m³. The level in the float chamber is 3 mm below the top of the jet when the engine is not running. Ambient conditions are 1.013 bar and 21°C. The jet diameter is 1.2 mm and its discharge coefficient is 0.65. The discharge coefficient of air is 0.80. The air/fuel ratio is 15:3:1. Determine the critical air velocity, the depression at the throat in mm of H₂O and the effective throat diameter. Neglect the compressibility of air. [15]

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- 5.a) Deduce an expression to evaluate piston displacement from the TDC position in terms of crank angle, crank radius and connecting rod length.

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- b) What is a multi-fuel engine? What are the requirements of any other engine to operate as a multi-fuel engine? [8+7]

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6. A four cylinder four stroke SI engine has an output of 65 KW at 2000 rpm. A Morse test is carried out and the brake torque readings are 185, 190, 176 and 182 Nm respectively. The specific fuel consumption for normal running of the engine at this speed is 0.365 kg/kWh. The calorific value of the fuel is 44,000 kJ/kg. Calculate the mechanical and brake thermal efficiencies of the engine. [15]

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- 7.a) Show the T-s diagram for a reaction gas turbine stage and explain its theory.

- b) What is the essential difference between turboprop and turbojet engine? In which speed range turboprop engine is more suitable than turbojet engine? Why? [8+7]

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- 8.a) What is meant by thrust augmentation? When is it necessary? Describe the two main methods of thrust augmentation.

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- b) What are the two main types of gas turbine combustion chambers? What are their relative advantages? [8+7]

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